Communication

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The Spirit Project: Strengthening the Capacities for Fostering Innovation Along Potato Value Chains in East Africa

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Abstract: The project SPIRIT was conducted in Tanzania, Rwanda, Uganda and Kenya from 2012 to 2016 with the aim of increasing the contribution of agricultural science, technology and innovation to social development in East Africa. The project involved literature research, on-site visits and meetings with farmers, research institutions and stakeholders, information compilation, database establishment and a project webpage. A strategy with three main objectives and associated actions was implemented. The first objective focused on the improvement of scientific and technological knowledge of East African research organizations. For this, state-of-the-art research on innovative technologies and practices for enhanced product quality was assessed; a web-based knowledge-sharing platform was created; the "East Africa Potato Research and Knowledge Exchange Forum" was constituted and six meetings with visits were realized. The second objective focused on private and civil society actors and governmental services and aimed at reinforcing their capacities for generating and adopting innovative technologies and practices. Sixteen innovation sessions were conducted. Guidelines for enhancing product quality along the potato value chain in East Africa were elaborated and disseminated. The third objective targeted governmental bodies with competences in policy-making for promoting changes in policies. Proposals for policy-makers were developed and transferred to relevant authorities.

Keywords: Capacity building, Potato quality, Knowledge Exchange Forum, Stakeholders, Policy-Makers, East Africa

1 Introduction

In Africa the potato crop (*Solanum tuberosum* L.) is almost entirely produced by small-scale farmers as a food and cash crop (Thiele et al. 2011; Devaux et al. 2014). The production of potato tubers in sub-Sharan Africa has more than doubled since 1994, with 70% of this growth being concentrated in Eastern Africa (Tesfaye et al. 2010). The crop has gained great importance in this region and contributes to the reduction in the proportion of people suffering from hunger and poverty. The main problems of the crop are the low yield, the varieties and the lack of a system of seed production. The water management is important to provide food for sustainable development. Due to the limited nature of water resources, the role of macroeconomic policies in agricultural water management is vital and undeniable. Actual crop yield as a percentage of potential yield is less than 50% for South America and North Africa (Valipour 2013; Valipour et al. 2015). Valipour (2015) also examines land use policy and agricultural water management in Africa from 1962 to 2011.

SPIRIT was a collaborative three-year project and was implemented by INKOA SISTEMAS (Erandio, Spain, Coordinator), Agricultural Research Institute – UYOLE (Mbeya, Tanzania), College or Agriculture, Animal Sciences and Veterinary Medicine (Kigali, Rwanda), Makerere University (Kampala, Uganda), University of

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Nairobi (Nairobi, Kenya) and NEIKER (Vitoria, Spain). The project was conducted in Uganda, Rwanda, Kenya and Tanzania. The aim was to strengthen the capacities in scientific research and adoption of innovative technologies and practices, in order to enhance product quality along the potato value chain in East Africa. Through this the project contributed to building capacities in the area of Agricultural Science, Technology and Innovation (ASTI) in East Africa.

Bolwig et al. (2010) help clarify the conceptual linkage between market opportunities and development outcomes: Many contemporary development policy prescriptions place emphasis on the potential for closer integration of poor people with areas with global markets. But the prospects for poverty reduction depend in great measure on the nature of the broader economic processes that, according to how they are configured, can either exacerbate or alleviate poverty, and also on the forms of local economic growth that impact on the lives of those stuck in long-term poverty or threatened with impoverishment.

To achieve this general objective of SPIRIT the following specific objectives were envisaged, considering also concepts from Webber and Labaste (2010) related to value chains:

O1: Strengthening the scientific and technological knowledge of key East African research organizations on innovative technologies and practices for enhancing potato quality along the value chain.

O2: Reinforcement of the capacities of key stakeholders of the potato value chain for generating and adopting innovative technologies and practices for enhanced product quality.

O3: Promoting changes in policies, regulations and standards in order to foster the generation and implementation of innovations.

2 Material And Methods

To achieve the specific objectives (O_i) we have implemented methodologies used in Neiker, and hence the following three actions (A_i) were implemented:

A1.1. Assessment of the state-of-the-art of the potato value chain in East Africa, including innovative technologies and practices for enhanced quality and research capacities.

This included first the characterization of the potato value chain in East Africa and the identification of the main critical points along the value chain with potential to hinder product quality. Management practices and technologies employed by the main actors along the value chain at the national and regional level were assessed. Organizations working on research lines related to technological innovation, potato quality issues and value chain assessment were identified and a database classifying the organizations on the basis of their research lines was established. Finally the technological innovations and research capacities of East African research organizations to be strengthened were determined.

A1.2. Establishment of a knowledge-sharing WEB platform for permitting communication and exchange of information between the members of the platform and relevant stakeholders.

A1.3. Constitution and start-up of the "East Africa Potato Research and Knowledge Exchange Forum", which gathers together 15 key research organizations.

This activity included the constitution of the forum and the conduction of six knowledge-exchange events, the conduction of technical visits and the constitution and strengthening of research groups. The topics of the six knowledge-exchange event meetings were:

- Seed certification regulations and standards;
- Food safety and quality regulations and standards, including traceability and management of information;
- Financing and credit policies for adoption of new and innovative technologies in processing industries;
- Fostering the adoption of Good Agricultural Practices (GAPs) among farmers at the production and post-harvest level;
- Fostering the adoption of best manufacturing practices by the processing industries;
- Policies for fostering product commercialization.

A2.1. Identification of relevant stakeholders from the private sector (smallholder farmers, processing companies, wholesalers), civil society (farmer-based organizations, development organizations) and governmental services (extension workers, national inspection services) relevant for potato value chains in Rwanda, Tanzania, Kenya and Uganda.

A2.2. Preparation and execution of four innovation sessions each with a different topic, which were executed in each country with the previously identified relevant stakeholders.

The topics of the innovation sessions were:

- Innovative technologies and best practices for enhancing quality management along the seed potato value chain in East Africa;

- Production and post-harvest technologies and practices for improving potato quality in East Africa;
- Enhancing product quality in the potato industry processing sector of East Africa;
- Enhanced control of product quality and management of information along the potato value chain in East Africa.

A2.3. Elaboration and dissemination among relevant stakeholders of a set of guidelines for enhancing product quality along the potato value chain in East Africa through innovative technologies and practices.

A3.1. Development of proposals for policy-makers in order to foster the implementation of innovations along the potato value chain through modifications in existing policies, regulations and standards.

For this purpose, benchmark countries outside the project with successful policies, regulations and standards were first identified. Then in each East African country participating in the project, gaps and weaknesses of policies, regulations and standards were assessed, leading to the development of proposals.

3 Results

Within the Dissemination Plan of the SPIRIT project a web page has been established (http://www.spiritacp.com) which contains all details of the results obtained in each action. Within the frame of this publication we can give only examples of the achieved results.

The first level of intervention, which focuses on key East African research organizations, will bring as a result the strengthening of the scientific and technological knowledge of these organizations on innovative technologies and practices for enhancing product quality along the potato value chain. To achieve this, the action will:

- Assess the state-of-the-art of research on innovative technologies and practices for enhanced product quality in East Africa.
- Create a web-based knowledge-sharing platform in order to provide the members of the Partnership and other relevant stakeholders with a tool for permitting communication and exchange of information between them.
- Constitute and start up the "East Africa Potato Research and Knowledge Exchange Forum", forum that will be made up of the most relevant organizations working on potato research in East Africa.

The second level of intervention focuses on private and civil society actors and on governmental services relevant for the potato value chain and will bring as a result the reinforcement of the capacities of these key stakeholders for generating and adopting innovative technologies and practices for enhancing product quality. To achieve this, the action will:

- Prepare and conduct at least 16 innovation sessions with these relevant stakeholders.
- Elaborate and disseminate guidelines for enhancing product quality along the potato value chain in East Africa through innovative technologies and practices.

The third level of intervention targets governmental bodies with competences in policy-making and will bring as a result the promotion of changes in policies to foster the generation and implementation of innovations along the potato value chain in East Africa. To do this, the action will:

- Develop proposals for policy-makers building on the conclusions attained during the workshops and the innovation sessions, and on specific studies undertaken.
- Transer the proposals to relevant authorities at both national and regional levels by means of the conduction of specific meetings.

The *knowledge-exchange events* have been complemented with technical visits to key organizations in the region, such as research centres, governmental institutions and private companies dealing with activities related to the potato value chain. In Tanzania for example the members visited the Agricultural Research Institute - Uyole. This visit included the presentation of new potato varieties, systems for pre-basic seed multiplications, such as the tissue culture laboratory, aeroponic and sandy hydroponic greenhouses and preservation facilities such as diffused light stores (DLS).

The Njombe Agricultural Development Organization (NADO) was also visited. This is an organization covering members from 19 villages in the Njombe district. The visit facilitated learning about the activities of NADO such as common purchase of seeds and fertilizers, the implemented micro financing system, the links of NADO with stakeholders and challenges for dissemination of new potato varieties and other potato innovations through farmer organizations or cooperatives. A private potato processing company, CRISPO, located in the Iringa region was visited which produces potato crisps and employs a considerable amount of man power in this process.

Finally, the Mtanga farm, a private company also located in the Iringa region was inspected. The Mtanga

farm multiplies the varieties bred by ARI-Uyole and markets certified seeds. Visitors learned about variety multiplication, business challenges and variety preferences of customers.

A total of 16 *innovation sessions* have been held in Kenya, Uganda, Rwanda and Tanzania with over 400 attendants. Research organizations and relevant stakeholders participated together in these sessions. Practical case studies of the advantages of innovation along the value chain were shown and possibilities of collaboration between the different actors involved were identified. Stakeholders' opinions on the main gaps and weaknesses of existing policies, regulations and standards were recorded in several reports. In summary, the following major gaps and weaknesses were identified and, in some cases, easy suggestions for improvement can be given:

- Poorly equipped and less informed farmers make use of old, outdated farming methods. Continuous capacity building and improved extension services are required.
- Information on how to access potato seed and other agricultural inputs is scanty. Access to this information could be improved through easy to use WEB portals and proper extension services.
- Insufficient or a lack of quality potato seeds, since few seed potato producers exist.
- Poor knowledge on pest and disease control management exists and there are only few efforts to make farmers aware of the need to disinfect their soils. Examples of good practices are given by Kakuhenzire et al. (2007).
- Soils are losing their fertility, and soil exhaustion is becoming a serious challenge. Good Agronomical Practices (GAPs) need to be implemented.
- Storage facilities are still poor and small in size.
- Transportation of the products is difficult in isolated production areas.
- Poor coordination and integration of marketing channels, as well as weak linkage between industry and producers.
- Generally weak or lack of collective marketing which makes it hard for the processors to penetrate new markets. Kaganzi et al. (2009) and Markelowa et al. (2009) presented successful actions to overcome this problem.
- Limited access to long-term financing for small-scale processors.
- Poor knowledge on potato value addition by actors along the chain.
- Inadequate potato processing equipment.
- Processors do not follow the standards which are set by Governmental Authorities.
- Processing varieties are generally more susceptible to diseases and require a proper plan on disease protection.
- Stakeholders are not informed on how best standards will boost their sales if they adhere to them.
- Standards are hard to understand, and they need to be translated to the local languages. Illustrations are needed to help farmers to understand them.
- Farm book and related innovations using digital platforms are not exploited.
- Lack of or inadequate informatics platforms for information management and capacity building for the various potato value chain actors.
- Lack of general awareness on many initiatives in the potato sector.

With respect to the *proposals for policy-makers* a study was carried out as part of the project where on one hand benchmark countries outside the project with successful policies, regulations and standards in terms of implementation of technological innovations and best practices for enhanced potato quality were identified, and on the other hand, common gaps and weaknesses of policies at the regional level were identified. The most relevant conclusions derived from the actions carried out in the project were the following:

- East African countries lack specific policies for potato seed, and the standards for seed potato production and marketing are administrated by different agencies according to their own interpretation. Policies need to be developed and managed by a specific entity, cascading it down from Central to County Governments.
- Despite a large number of policies, regulations and standards aimed at regulating standards, traceability and management of information, there is a lack of clarity on the role of the different enforcement bodies. Thus, there is a need for restructuring the system and defining specific roles; this will call for increased funding and increased technical support.

Regarding financing and credit policies for adoption of new and innovative technologies in processing industries, some policies have been designed and are ready for implementation. Good Agronomical Practices (GAPs) covering the horticultural industry are well developed by Governmental Authorities, though they focus mainly on flowers. Their adoption in potato production is minimal, since little or no attention is placed on potato in terms

of regular inspection of farmers and financial support. Specific GAPs for potato need to be customized for this sub-sector.

- There is little coordination of policy implementation by the governments regarding the adoption of best manufacturing practices by processing industries. This may be due to low industry development, and limited foreign market. Therefore, there is need to emphasis on product quality and to adhere to regulations by all actors of the potato value chain in order to meet a minimum quality.
- Only a few agricultural extension services exist. Potato-specific extension policy would be a big boost for producers who are limited by agronomic and post-harvest handling knowledge.
- Not many policies have been set to foster commercialization. The processing industry is under developed with very few actors engaged in processing. This reduces the pressure to produce quality products on the manufacturers because of the limited competition and high demand for their products. Under these circumstances, adherence to standards and regulations is also neglected. With policy in place and with some incentives from the government to produce quality products, there is a great future for change and increased commercialization of products.

The results of this study were used for developing new proposals for policy-makers suggesting modifications in existing policies, regulations and standards in order to foster the adoption of innovations along the potato value chain. Beside the aforementioned project web page with more general information, the SPIRIT project has also established within this page the *East Africa Potato Value Chain Knowledge Sharing Portal* (http://forum.spiritacp.com:83/), which requires registration. The portal, which will be maintained in the future, aims to address scientific and technological topics in the field of agricultural value-chain innovations by enabling East African research organizations to share scientific knowledge and technological innovations. The knowledge-sharing platform has been designed with the aim of permitting easy access to different tools and sections.

The "Resources" section allows sharing information on relevant research and technological development documents related to the potato and agricultural value chain. The user can share scientific papers, guidelines, training materials, case studies or links to other relevant websites.

The "Countries" tool classifies all the information of the platform (resources, news and events) into the following countries: Rwanda, Uganda, Tanzania, Kenya, UE and others, providing a database of researchers per topic and country, aiming to promote the contact among researchers of different countries.

The ''Researchers'' database contains the contact details of relevant researchers from East Africa and Europe whose activities are related to the potato sector but also to other agri-food sectors. "News and Events" permits the user to stay informed of the latest news and events, specifically focused on those concerning East Africa or Europe.

4 Discussion

The different actions of the SPIRIT project have generated numerous results and experiences. During the analyses of the potato value chain in the different countries in action A1.1 (see Material and Methods) and the experiences during the technical visits in the frame of the knowledge exchange events (A1.3), some general problems were identified, such as low productivity, small parcel sizes, low availability and use of quality seeds, agrochemicals and phytosanitary products, inadequate storage facilities, missing quality control, and particularly little profit for the farmers.

A web-based knowledge-sharing platform which includes over 400 members from relevant stakeholder organizations has been established in action A1.2, which integrates the 'East African Potato Research and Knowledge Exchange Forum (A1.3) that is composed of over 15 research organizations. These activities permitted the creation of four new research groups from different East African countries with research interests in potato quality. These groups have also launched four new research project proposals involving relevant stakeholders of the value chain.

In order to link all actors of the potato value chain, several innovation sessions covering different topics were conducted in each country within action A2.2, which required the relevant stakeholders identified in action A2.1. During these sessions a lack of communication between value chain actors became evident. There were also only a few opportunities for the different actors to come together, to analyse shared constraints and to innovate. Producers, transporters, marketers, wholesalers and retailers are fragmented and tend not to cooperate, which was also reported by McCullough et al. (2008). Enhancing quality along the value chain would entail, among others: i) increasing farmer's incomes through higher prices and ii) ensuring food safety and quality.

Based on the participation in these sessions an increase in the capacities of over 120 East African researchers and over 250 relevant actors along the potato value chain could be achieved. Fruits of these events were also the redaction of a set of four guidelines for fostering the implementation of innovative technologies and best practices for the potato value chain in East Africa (A2.3).

The exploitation of all these experiences and after analysing the actual situation in bench mark countries outside of the project within action A3.1, a set of recommendations for policy-makers to modify existing regulations, to foster the adoption of innovations and to generate new innovative technologies and practices throughout the potato value chain, was released by each partner country.

Finally the general strategy, which has been successfully applied specifically to the Potato Value Chain in East Africa, can be also easily extended to other regions and even to other crops.

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